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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/764,437	01/27/2004	Yu-Kun Chen	4425-344	8694

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EXAMINER	
NOVACEK, CHRISTY L	
ART UNIT	PAPER NUMBER
2822	

DATE MAILED: 10/06/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/764,437	CHEN ET AL.	
	Examiner	Art Unit	
	Christy L. Novacek	2822	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 January 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *12-20* is/are allowed.

6)☒ Claim(s) *1,2,4-6,8,10 and 11* is/are rejected.

7)☒ Claim(s) *3, 7 and 9* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

This office action is in response to the communication filed January 27, 2004.

Claim Objections

Claims 1 and 12 are objected to because of the following informalities: Claim 1 recites the limitation of "performing a carbon-containing plasma treatment *for* said insulator layer" (emphasis added). Claim 12 recites the limitation of "performing a carbon-containing plasma treatment *for* said oxide liner" (emphasis added). The term "for" is unnecessarily confusing and clumsy. It would be more appropriate to state that the treatment is performed "on" the insulator layer or "treating the insulator layer with a carbon-containing plasma". Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 2, 5, 8 and 10 are rejected under 35 U.S.C. 102(e) as being anticipated by Kakamu et al. (US 6,794,693).

Regarding claim 1, Kakamu discloses providing a semiconductor substrate, forming a gate structure on the substrate, implanting a dopant into the substrate to form a junction region, forming an insulator layer (77/116) on the gate structure and substrate, performing a carbon-

containing plasma treatment on the insulator layer and performing a heat treatment for the substrate (col. 4, ln. 2 – col. 6, ln. 18).

Regarding claim 2, Kakamu discloses forming a spacer on a side-wall of the gate structure and implanting the dopant to form source/drain regions next to the junction region.

Regarding claim 5, Kakamu discloses that the carbon-containing plasma uses a source containing carbon dioxide (col. 6, ln. 8-18).

Regarding claim 8, Kakamu discloses that the dopant is boron (Group III element) (col. 4, ln. 59-62).

Regarding claim 10, Kakamu discloses that the heat treatment is conducted within the range of 500-1200°C.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 4 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kakamu et al. (US 6,794,696).

Regarding claim 4, Kakamu does not disclose the depth of the junction region. At the time of the invention, it would have been obvious to one of ordinary skill in the art to use routine experimentation to determine an optimal depth of the junction of Kakamu, depending upon the type of semiconductor device being formed and the material of the substrate because such

variables of art recognized importance are subject to routine experimentation and discovery of an optimum value for such variables is obvious. See *In re Aller*, 105 USPQ 233 (CCPA 1955).

Regarding claim 6, Kakamu discloses the plasma power in terms of watts and not in terms of watts per area. At the time of the invention, it would have been obvious to one of ordinary skill in the art to use routine experimentation to determine an optimal power density at which to conduct the plasma treatment of Kakamu because such variables of art recognized importance are subject to routine experimentation and discovery of an optimum value for such variables is obvious. See *In re Aller*, 105 USPQ 233 (CCPA 1955).

Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kakamu et al. (US 6,794,696) in view of Horstmann et al. (US 6,798,028).

Regarding claim 11, Kakamu does not disclose what type of heating is used. Like Kakamu, Horstmann discloses a process of forming a transistor. Horstmann teaches that semiconductor substrate can be heated in a rapid thermal annealing treatment (col. 5, ln. 34-37). At the time of the invention, it would have been obvious to one of ordinary skill in the art to use the rapid thermal annealing system of Horstmann to perform the heating treatment of Kakamu because the rapid thermal system requires little processing time and because this process is conventional in the art.

Allowable Subject Matter

Claims 12-20 are allowed.

Claims 3, 7 and 9 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is an examiner's statement of reasons for allowance:

The primary reasons for the allowance of claims 12-20 is the inclusion therein, in combination as currently claimed, of the limitations of forming a first spacer layer on the gate, forming an oxide liner on the first spacer, performing a carbon-containing plasma treatment for the oxide liner and forming a second spacer on the first spacer. These limitations were found in claims 12-20 and are neither disclosed nor taught by the prior art of record, alone or in combination.

The primary reason for the indication of the allowable subject matter of claim 3 is the inclusion therein, in combination as currently claimed, of the limitation of forming an insulator layer on the gate, performing a carbon-containing plasma treatment for the insulator layer, forming a nitride layer on the insulator layer and removing a portion of the nitride layer and insulator layer to form a spacer. This limitation is found in claim 3 and is neither disclosed nor taught by the prior art of record, alone or in combination.

The primary reason for the indication of the allowable subject matter of claim 7 is the inclusion therein, in combination as currently claimed, of the limitation of forming an insulator layer on the gate such that the insulator layer is a liner oxide and performing a carbon-containing plasma treatment for the insulator layer. This limitation is found in claim 7 and is neither disclosed nor taught by the prior art of record, alone or in combination.

The primary reason for the indication of the allowable subject matter of claim 9 is the inclusion therein, in combination as currently claimed, of the limitation of forming an insulator layer on the gate and performing a carbon-containing plasma treatment for the insulator layer such that the plasma treatment is performed to penetrate carbon atoms into the junction region. This limitation is found in claim 9 and is neither disclosed nor taught by the prior art of record, alone or in combination.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christy L. Novacek whose telephone number is (571) 272-1839. The examiner can normally be reached on Monday-Thursday and alternate Fridays 7:30 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on (571) 272-1852. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

CLN
October 3, 2005